National Aeronautics and Space Administration

TOPEX/Poseidon

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The Ocean Topography Experiment (TOPEX)/ Poseidon is a cooperative project between the United States and France to develop and operate an advanced satellite system dedicated to observing Earth's oceans. The mission provides global sea level measurements with an unprecedented accuracy. The data from TOPEX/Poseidon is used to determines global ocean circulation and to understand how the oceans interact with the atmosphere. This understanding improves our ability to predict global climate.

For this joint mission, the National Aeronautics and Space Administration (NASA) provided the satellite bus and five instruments with their associated ground elements. NASA's Jet Propulsion Laboratory is responsible for project management and operates and controls the satellite through NASA's Tracking and Data Relay Satellite System. The Centre Nationale d'Etudes Spatiales (CNES) furnished two instruments with their associated ground elements and dedicated a launch on an Ariane rocket. Both CNES and NASA provided precision orbit determination, and processed and distributed data to scientists from more than nine nations.

In the summer of 1992, an Ariane rocket launched TOPEX/Poseidon into orbit from the European Space Agency's Space Center located in Kourou, French Guiana. From its orbit 830 miles (1,336 kilometers) above Earth's surface, TOPEX/Poseidon makes sea level measurements along the same path every 10 days using the dual frequency altimeter developed by NASA and the CNES single frequency solid-state altimeter. This information relates changes in ocean currents with atmospheric and climate patterns.

Measurements from NASA's Microwave Radiometer provides estimates of the total water vapor content in the atmosphere, which is used to correct errors in the altimeter measurements. These combined measurements allow scientists to chart the height of the seas across ocean basins with an accuracy of 5 centimeters.

Three independent techniques determine the satellite altitude to within 5 centimeters. NASA's Laser Retroreflector Array is used with a network of 10 to 15 satellite laser ranging stations to provide tne baseline tracking data for precision orbit determination and calibration of the radar altimeter bias. The DORIS system provides an alternate set of tracking data using microwave Doppler techniques. The system is composed of an onboard receiver and a network of 40 to 50 ground transmitting stations, providing all-weather global tracking of the satellite. NASA's Global Positioning System Demonstration Receiver demonstrated a new technique for precise, continuous tracking of the spacecraft.

TOPEX/Poseidon is vital part of a strategic research effort to explore ocean circulation and its interaction with the atmosphere. It was timed to coincide with and complement a number of international oceanographic and meteorological programs, including the World Circulation Experiment (WOCE) and the Tropical Ocean and Global Atmosphere (TOGA) Program, both of which are sponsored by the World Climate Research Program (WCRP). TOPEX/Poseidon will build the foundation for a continuing program of long-term observations of ocean circulation from space, and for an extensive ocean monitoring program in the next century.